

American Museum **Novitates**

PUBLISHED BY THE AMERICAN MUSEUM OF NATURAL HISTORY
CENTRAL PARK WEST AT 79TH STREET, NEW YORK 24, N.Y.

NUMBER 2144

JULY 3, 1963

Results of the Puritan-American Museum of Natural History Expedition to Western Mexico

18. Cyclostomata, Ctenostomata (Ectoprocta), and Entoprocta of the Gulf of California

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INTRODUCTION

The present study, the last of a series of three reports on the bryozoans of the Gulf of California collected by the Puritan-American Museum Expedition to Western Mexico, describes representatives of the two smaller suborders of the phylum Ectoprocta, namely, the Cyclostomata and the Ctenostomata. In addition to these groups, one species of the phylum Entoprocta is included, adding 29 species to the 131 species recorded in the two previous reports (Soule, 1959, 1961).

The format follows that used in the previous reports: (1) the original citation, primary synonyms, and previously reported occurrences in the eastern Pacific; (2) a summarization of essential diagnostic features; (3) occurrences in the Gulf of California listed by collecting stations; and (4) a brief summary of the previously known distribution within the Gulf of California and in other waters. Additional station data, including the

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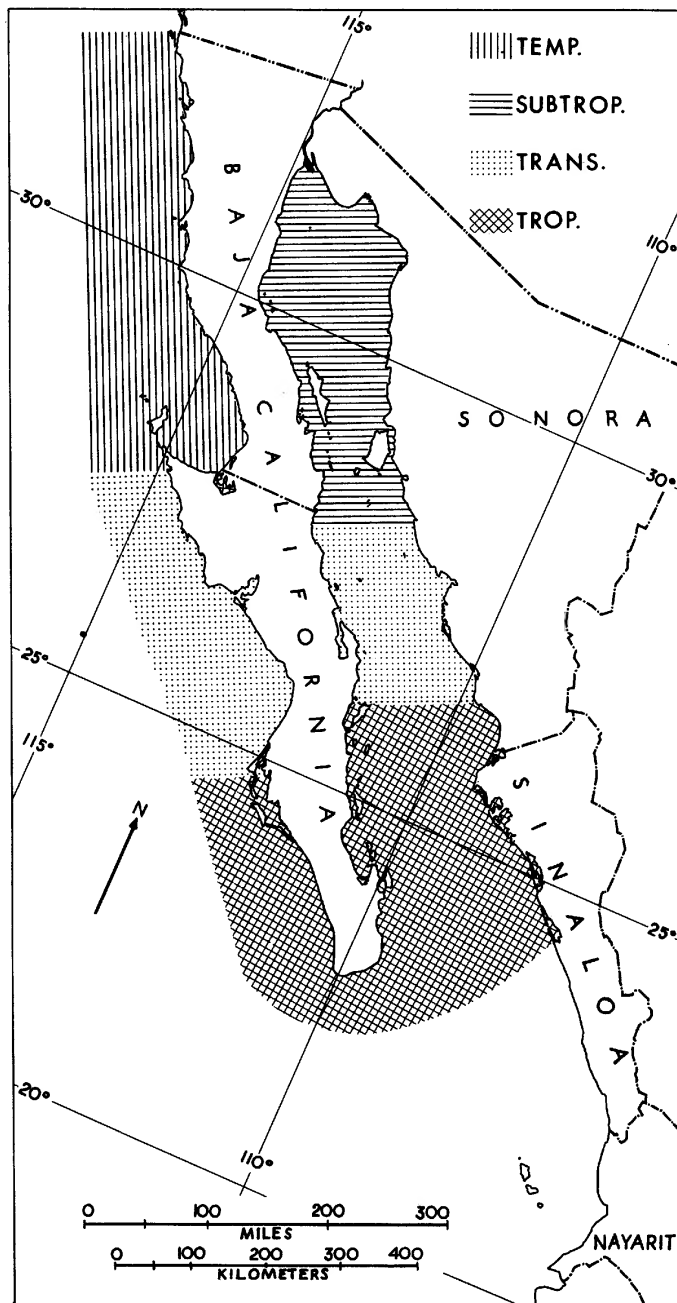


FIG. 1. Zonation of the littoral Ectoprocta of the Gulf of California, as compared with the littoral ectoprocts from the Pacific coast of Baja California.

longitude and latitude, collecting method, substrate type, and date of collection, are given in the General Account of the expedition (Emerson, 1958).

The distribution of the Recent bryozoan fauna of the Gulf of California and the Pacific coast of Baja California is summarized, and the species are listed, with occurrences in other regions indicated.

Without the cooperation of members of the staff of the American Museum of Natural History, this study could not have been completed. I wish particularly to thank Dr. William K. Emerson, Chairman of the Department of Living Invertebrates, and to acknowledge my gratitude to the late Mr. Harry J. Bauer of Los Angeles, the co-sponsor of the expedition, for the opportunity to participate on the cruise of his schooner "Puritan." This study was, in part, augmented by a Grant-in-Aid from the Society of the Sigma Xi.

SYSTEMATIC ACCOUNTS

SUBORDER CYCLOSTOMATA BUSK, 1852

DIVISION I, TUBULIPORINA HAGENOW, 1851

FAMILY ONCOUSOECHIDAE CANU, 1918

GENUS *STOMATOPORA* BRONN, 1825

Stomatopora granulata (Milne-Edwards), 1838

Alecto granulata MILNE-EDWARDS, 1838, Ann. Sci. Nat., Zool., ser. 2, vol. 9, p. 205, pl. 16, figs. 3, 3a.

Stomatopora granulata, C. H. AND E. O'DONOGHUE, 1923, Contrib. Canadian Biol., new ser., vol. 1, no. 10, p. 153.

Stomatopora granulata, C. H. AND E. O'DONOGHUE, 1925, Trans. Puget Sound Biol. Sta., vol. 5, p. 93.

Stomatopora granulata, C. H. AND E. O'DONOGHUE, 1926, Contrib. Canadian Biol. Fish., new ser. vol. 3, p. 63.

Stomatopora granulata, OSBURN, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, pp. 619, 620, pl. 65, figs. 1, 2.

The white, uniserial, irregularly branching colonies are adnate, attached to the shells of mollusks. The zooecia are free only at their distal extremities, curving upward into a rounded terminal aperture (peristomes of authors). Young zooecia are marked by fine pseudopores, in contrast to the older zooecia which become well calcified and roughened. Ooecia, not present on the four colonies in this collection, were described by Osburn (1950-1953, no. 3) as follows: "Simple, proximal end narrow, irregularly pyriform with small lobes extending between the peristomes

at the sides. The oeciostome is an erected tube shorter than the peristome, its tip free and the aperture circular."

OCCURRENCE: Station 089, Los Frailes Bay, Baja California, 20–40 fathoms. Station 123, Aqua Verde Bay, Baja California, 1–3.25 fathoms. Station 160, off Tiburón Island, 20–22 fathoms.

DISTRIBUTION: *Stomatopora granulata*, according to available records, is found in cool temperate, warm temperate, and tropical waters. Osburn (1950–1953, no. 3) listed it from off southern California in the eastern Pacific. A check of the Hancock collections reveals additional material from Cocos Island, Costa Rica (bottom sample 328), and Natividad Island, Mexico (Hancock station 1258–41). Neither of these localities has been previously reported, and there has been no prior report of this species from the Gulf of California.

FAMILY DIASTOPORIDAE GREGORY, 1899

GENUS *PLAGIOECIA* CANU, 1918

Plagioecia sarniensis (Norman), 1864

Diastopora sarniensis NORMAN, 1864, Ann. Mag. Nat. Hist., ser. 3, vol. 13, pp. 89, 90, pl. 11, figs. 4–6.

Diastopora sarniensis, HINCKS, 1884, Ann. Mag. Nat. Hist., ser. 5, vol. 13, p. 206.

Microecia sarniensis, C. H. AND E. O'DONOGHUE, 1925, Trans. Puget Sound Biol. Sta., vol. 5, p. 94.

Microecia sarniensis, C. H. AND E. O'DONOGHUE, 1926, Contrib. Canadian Biol. Fish., new ser., vol. 3, p. 67.

Plagioecia (Diastopora) sarniensis, C. H. AND E. O'DONOGHUE, 1926, Contrib. Canadian Biol. Fish., new ser., vol. 3, p. 68.

Plagioecia sarniensis, OSBURN, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, pp. 632, 633, pl. 73, fig. 3.

The irregularly elliptical colonies encrust mollusk shells and coralline algae. The zooecia are small, submerged for most of their length, arising distally into a slender, tubular, terminal aperture. The ovicells are inconspicuous, weakly inflated, lobular, irregular, with a small, distally placed oeciostome.

OCCURRENCE: Station 164, San Esteban Island, intertidal. Station 173, Puerto Refugio, Angel de la Guarda Island, 17–19 fathoms.

DISTRIBUTION: World-wide in warm and cool temperate waters as well as in tropical. Osburn (1950–1953, no. 3) reported one specimen from the Gulf of California at 32 fathoms, off San Esteban Island, bottom sample 276.

Plagioecia tortuosa Osburn, 1953

Mesenteripora meandrina, ROBERTSON, 1910, Univ. California Publ. Zool., vol. 6, no. 12, pp. 251, 252, pl. 23, figs. 36–38. Not Wood, 1844.

Plagioecia tortuosa OSBURN, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, pp. 633, 634, pl. 67, figs. 8, 9.

The colonies are bi-laminate, fan-shaped, misshapen, asymmetric, each arising from an encrusting basal area. The zooecia are of moderate size, submerged except for a short, free, rounded, terminal aperture. Basically the zooecia are alternate in arrangement, but, with the distortion in the erect portions of the colony, this arrangement is lost. The ovicells are large, swollen, granular in appearance, encompassing several of the erect zooecial tubules. The oöciostome is small, short, erect.

OCCURRENCE: Station 141, Marquer Bay, Carmen Island, 0.5–2 fathoms. Station 145, off Coronados Island, 13–16.5 fathoms.

DISTRIBUTION: Records on this species are relatively few. Robertson (1910) reported it from off the coast of southern California, and Osburn (1950–1953, no. 3) recorded it from off southern California, off the west coast of Mexico (Baja California), and in the Gulf of California. In the Hancock collections an additional specimen from Guadalupe Island, Mexico (bottom sample 72), has been found. This appears to be a warm temperate to subtropical species.

FAMILY TUBULIPORIDAE JOHNSTON, 1838

GENUS *TUBULIPORA* LAMARCK, 1816*Tubulipora tuba* (Gabb and Horn), 1862

Semitubigera tuba GABB AND HORN, 1862, Jour. Acad. Nat. Sci. Philadelphia, new ser., vol. 5, pt. 2, art. 3, p. 169, pl. 21, fig. 57.

Tubulipora occidentalis ROBERTSON, 1910, Univ. California Publ. Zool., vol. 6, no. 12, p. 249, pl. 22, figs. 29–31.

Tubulipora tuba, CANU AND BASSLER, 1923, Bull. U. S. Natl. Mus., no. 125, p. 198, pl. 42, figs. 18–23.

Tubulipora occidentalis, C. H. AND E. O'DONOGHUE, 1923, Contrib. Canadian Biol., new ser., vol. 1, p. 150.

Tubulipora tuba, C. H. AND E. O'DONOGHUE, 1925, Trans. Puget Sound Biol. Sta., vol. 5, p. 95.

Tubulipora tuba, C. H. AND E. O'DONOGHUE, 1926, Contrib. Canadian Biol. Fish., new ser., vol. 3, pp. 70, 71.

Tubulipora tuba, OSBURN, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, p. 650, pl. 68, fig. 9.

Tubulipora tuba, SOULE AND DUFF, 1957, Proc. California Acad. Sci., vol. 29, no. 4, pp. 132, 133.

The colonies are large, adherent to the stipes of marine algae. They are purple-gray in color, irregularly rounded, and occasionally lobulate. The zooecia are tubular (peristomes), erect, and frequently very much elongated. They radiate from the center of the colony in uniserial or biserial series. The ovicells are frequently large, inflated, porous, each bearing an elongated ooeciostome with a compressed apertural region.

OCCURRENCE: Station 159, off Tiburón Island, 10 fathoms. Station 168, off Angel de la Guarda Island, 16–17 fathoms. Station 173, Puerto Refugio, Angel de la Guarda Island, 17–19 fathoms.

DISTRIBUTION: *Tubulipora tuba* is an abundant species in both cool temperate and warm temperate waters. It is significant that it was not taken in the Gulf of California south of Tiburón Island by the Puritan expedition, which conforms with the findings of the Hancock expeditions, which took this species at Raza Island in the Gulf of California, at a latitude just north of the southern tip of Tiburón Island.

Tubulipora pacifica Robertson, 1910

Tubulipora pacifica ROBERTSON, 1910, Univ. California Publ. Zool., vol. 6, no. 12, pp. 248, 249, pl. 22, figs. 27, 28.

Tubulipora pacifica, C. H. AND E. O'DONOGHUE, 1923, Contrib. Canadian Biol., new ser., vol. 1, p. 150.

Tubulipora pacifica, C. H. AND E. O'DONOGHUE, 1926, Contrib. Canadian Biol. Fish., new ser., vol. 3, p. 71.

Tubulipora pacifica, OSBURN, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, pp. 652, 653, pl. 68, fig. 1.

The colonies are small, white, forming circular to fan-shaped encrustations adherent to algae, mollusk shells, and rocks. The zooecia are submerged for much of their length, arise distally into elongate slender tubules (peristomes) with rounded terminal apertures. The zooecia are arranged in irregular radial or biradial series. The ovicells are low, weakly inflated, and include the area of two or three zooecial rows. Each ooeciostome is short and ovoid and has a widely flaring apertural area.

OCCURRENCE: Station 103, off Isla Partida, 12–13 fathoms. Station 109, San Francisco Island, intertidal. Station 115, off San José Island, 13.5–17.5 fathoms. Station 119, off San Diego Island, 10–15 fathoms. Station 133, off Carmen Island, 20 fathoms. Station 141, Marquer Bay, Carmen Island, 0.5–2 fathoms. Station 143, Coronados Island, intertidal. Station 144, off Coronados Island, 13–16.5 fathoms. Station 158, off Tiburón Island, 1–3 fathoms. Station 161, off Tiburón Island, 30–32 fathoms. Station 164, off San Esteban Island, intertidal to 3 fathoms. Station 167, off Angel de la Guarda Island, 15–17 fathoms. Station 168,

off Angel de la Guarda Island, 16–17 fathoms. Station 173, Puerto Refugio, Angel de la Guarda Island, 17–19 fathoms.

DISTRIBUTION: Originally described from the channel islands off southern California by Robertson (1910), this species is now known to inhabit cool temperate waters, warm temperate waters, and tropical waters. It had not been previously reported from the Gulf of California.

Tubulipora flexuosa (Pourtales), 1867

Idmonea flexuosa POURTALES, 1867, Bull. Mus. Comp. Zool., vol. 1, p. 111.

Tubulipora flexuosa, OSBURN, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, pp. 653–655, pl. 71, fig. 11.

The colonies are lengthy, erect, branching, quite distinct in appearance from the other members of this genus in the Gulf of California. The zooecia are immersed in series, connate, and terminate in short, raised tubules (peristomes). The ovicells are inflated, spreading, wide, encompassing most of the area of two zooecial series. Each oeciostome is short, stout, and oval, and has a comparatively wide, flaring aperture.

OCCURRENCE: Station 120, off San Diego Island, 25–40 fathoms. Station 131, off Carmen Island, 41–45 fathoms. Station 133, off Carmen Island, 20 fathoms.

DISTRIBUTION: Described originally from the waters off Cuba (Pourtales, 1867), this species has since appeared in other collections from the Caribbean and tropical western Pacific. Osburn (1950–1953, no. 3) was the first person to report it from the eastern Pacific with material from Raza Island in the Gulf of California and James Island in the Galapagos. Specimens from two additional eastern Pacific areas have been found in the Hancock collections, namely, bottom sample 328, off Panama, at 14 fathoms, and bottom sample 450, off Charles Island, Galapagos, at 60 fathoms.

GENUS *FASCICULIPORA* D'ORBIGNY, 1847

Fasciculipora pacifica Osburn, 1953

Fasciculipora pacifica OSBURN, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, pp. 665, 666, pl. 70, figs. 1–4.

The morphology of the gray-colored colonies collected by the Puritan expedition varies greatly, from the comparatively small tubulipoid structures of the young forms to the older, very large, erect, massive expansions. The zooecia are partially submerged, arising into large, elongated, distal

tubules (peristomes of authors). Some of the zooecia occur singly; the majority, in connate bundles. The ovicells are best seen on the younger colonies. They are moderately large, weakly inflated, porous. The ooecio-stome is tubular, short, and relatively large in diameter.

OCCURRENCE: Station 084, Los Frailes Bay, Baja California, intertidal. Station 108, off Isla Partida, 0.5–3.25 fathoms. Station 109, San Francisco Island, intertidal. Station 111, off San Francisco Island, 0.5–4 fathoms. Station 112, Amortajada Bay, San José Island, 0.5–2.25 fathoms. Station 115, off San José Island, 13.5–17.5 fathoms. Station 119, off San Diego Island, 10–15 fathoms. Station 124, between Point San Marcial and Aqua Verde Bay, Baja California, 1–3 fathoms. Station 134, Salinas Bay, Carmen Island, 5–8 fathoms. Station 136, lagoon, Puerto Escondido, Baja California, intertidal. Station 141, Marquer Bay, Carmen Island, 0.5–2 fathoms. Station 144, off Coronados Island, 13–16.5 fathoms. Station 146, Ildefonso Island, intertidal. Station 147, off Pulpito Point, Baja California, 0.5–2 fathoms. Station 149, San Marcos Island, intertidal. Station 154, San Carlos Bay, Sonora, Mexico, intertidal. Station 158, off Tiburón Island, 1–3 fathoms. Station 160, off Tiburón Island, 20–22 fathoms. Station 167, off Angel de la Guarda Island, 15–17 fathoms. Station 173, Puerto Refugio, Angel de la Guarda Island, 17–19 fathoms.

DISTRIBUTION: Osburn (1950–1953, no. 3) described this species with material from two localities, namely, off southern California (Santa Cruz Island) and the upper part of the Gulf of California (San Felipe, Baja California). The Puritan collection greatly extends the known geographic range to the south into tropical waters and extends the bathymetric range from intertidal to 22 fathoms. A previously unreported specimen was found in the Hancock collections from station 532–36, San Francisquito Bay, Baja California, on the Gulf of California at 20 fathoms.

DIVISION II, ARTICULATA BUSK, 1859

FAMILY CRISIIDAE JOHNSTON, 1838

GENUS *FILICRISIA* D'ORBIGNY, 1853

Filicrisia franciscana (Robertson), 1910

Crisia franciscana ROBERTSON, 1910, Univ. California Publ. Zool., vol. 6, no. 12, pp. 233–235, pl. 18, figs. 1–4.

Crisia occidentalis, ROBERTSON, 1903, Univ. California Publ. Zool., vol. 1, no. 3, p. 116.

? *Crisidia gracilis* TRASK, 1857, Proc. California Acad. Nat. Sci., vol. 1, p. 101, pl. 5, fig. 3.

Crisia franciscana, C. H. AND E. O'DONOGHUE, 1923, Contrib. Canadian Biol., new ser., vol. 1, p. 149.

Crisidia franciscana, C. H. AND E. O'DONOGHUE, 1925, Trans. Puget Sound Biol. Sta., vol. 5, p. 94.

Crisidia franciscana, C. H. AND E. O'DONOGHUE, 1926, Contrib. Canadian Biol. Fish., new ser., vol. 3, p. 65.

Filicrisia franciscana, OSBURN, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, pp. 677, 678, pl. 72, fig. 4.

The fragile-appearing colonies are erect and jointed, and some branch thickly to form bush-like clusters. The zooecia are of moderate size, tubular, primarily straight, and are separated into internodes by dark brown to black joints. From three to as many as five zooecia constitute an internode. The ovicells are conspicuous, elongated, and well inflated, and each bears its oocciostome on the ventral (frontal) edge.

OCCURRENCE: Station 124, between Point San Marcial and Aqua Verde Bay, Baja California, 1–3 fathoms. Station 168, off Angel de la Guarda Island, 16–17 fathoms.

DISTRIBUTION: Reported originally from Puget Sound, Washington, to San Diego, California, by Robertson (1910), and found over the same area by Osburn (1950–1953, no. 3), this species is here recorded for the first time in the Gulf of California. The record marks a southern extension of range for this basically cool temperate to warm temperate species.

GENUS *CRISIA* LAMOUREUX, 1812

Crisia serrulata Osburn, 1953

Crisia serrulata OSBURN, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, pp. 679, 680, pl. 72, fig. 2.

Crisina serrata GABB AND HORN, 1862, Jour. Acad. Nat. Sci. Philadelphia, new ser., vol. 5, pt. 2, art. 3, pp. 174–175, pl. 21, fig. 66.

Crisia pacifica ROBERTSON, 1910, Univ. California Publ. Zool., vol. 6, no. 12, pp. 242, 243, pl. 20, figs. 16, 17.

Crisia serrata, CANU AND BASSLER, 1923, Bull. U. S. Natl. Mus., no. 125, pp. 196, 197, pl. 42, figs. 1–7.

Crisia pacifica, C. H. AND E. O'DONOGHUE, 1923, Contrib. Canadian Biol., new ser., vol. 1, p. 149.

Crisia serrata, C. H. AND E. O'DONOGHUE, 1926, Contrib. Canadian Biol. Fish., new ser., vol. 3, p. 64.

Crisia serrulata, SOULE AND DUFF, 1957, Proc. California Acad. Sci., ser. 4, vol. 29, no. 4, p. 134.

The colonies are large, erect, branching, and jointed. The zooecia are arranged in a regular pattern in two alternating series. They are attached (connate) except for the apertural area, which is free and turned abruptly in a ventral direction. Each internode may possess as many as 30 zooecia, or as few as 12. The ovicells are conspicuous, somewhat elongated, and

swollen. The oecioostome material from the Gulf of California is short, ovoid, flattened, and located distally.

OCCURRENCE: Station 162, off Tiburón Island, 40 fathoms.

DISTRIBUTION: This species is found with regularity from British Columbia to southern California, and off Baja California to about the area of Cedros Island. Between this area, and the Galapagos Islands where it has been reported (Osburn, 1950–1953, no. 3), there are no intermediate records. In the Gulf of California there is one previous citation: Osburn (1950–1953, no. 3) reported it from Angel de la Guarda Island at 21 fathoms, Hancock station 1051–40.

Crisia operculata Robertson, 1910

Crisia operculata ROBERTSON, 1910, Univ. California Publ. Zool., vol. 6, no. 12, pp. 240, 241, pl. 19, figs. 13–15.

Crisia operculata, C. H. AND E. O'DONOGHUE, 1923, Contrib. Canadian Biol., new ser., vol. 1, p. 149.

Crisia operculata, OSBURN, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, p. 681, pl. 71, figs. 6, 7.

The delicate colonies arise into erect, jointed fronds. The zooecia are alternate, narrow, and connate, and have a relatively lengthy, terminal, tubular extension. Each internode may have from 24 to 28 zooecia. The ovicells are conspicuous and swollen. The oecioostome is short and bears a lid-like projection above the aperture.

OCCURRENCE: Station 084, Los Frailes Bay, Baja California, intertidal. Station 087, Pulmo Reef, Baja California, 2–4 fathoms. Station 088, Los Frailes Bay, Baja California, 7–9 fathoms. Station 090, off Cerralvo Island, 2–3.5 fathoms. Station 097, off Espíritu Santo Island, 24–26 fathoms. Station 098, San Gabriel Bay, Espíritu Santo Island, 1–1.5 fathoms. Station 108, off Isla Partida, 0.5–3.25 fathoms. Station 110, off San Francisco Island, 1–2 fathoms. Station 114, Amortajada Bay, San José Island, 22–25 fathoms. Station 115, off San José Island, 13.5–17.5 fathoms. Station 119, off San Diego Island, 10–15 fathoms. Station 123, Aqua Verde Bay, Baja California, 1–3.25 fathoms. Station 138, off Puerto Escondido, Baja California, 18–20 fathoms. Station 144, off Coronados Island, 13–16.5 fathoms. Station 145, off Coronados Island, 40–45 fathoms. Station 159, off Tiburón Island, 10 fathoms. Station 167, off Angel de la Guarda Island, 15–17 fathoms. Station 168, off Angel de la Guarda Island, 16–17 fathoms. Station 173, Puerto Refugio, Angel de la Guarda Island, 17–19 fathoms.

DISTRIBUTION: This species was found in abundance in the southern portion of the Gulf of California to about the latitude of Coronados Island.

From this point northward the abundance of the colonies noticeably decreased. In my opinion, this is primarily a tropical and warm temperate species, the record from British Columbia (O'Donoghue and O'Donoghue, 1923) being erroneous. The Puritan collection greatly extends the known range of this species in the Gulf of California. In the Hancock collections a previously unreported record extends the geographical range south to Bahia Honda, Panama, Hancock station 114-33.

GENUS *CRISULIPORA* ROBERTSON, 1910

Crisulipora occidentalis Robertson, 1910

Crisulipora occidentalis ROBERTSON, 1910, Univ. California Publ. Zool., vol. 6, no. 12, pp. 254-256, pl. 21, figs. 22-24.

Crisulipora occidentalis, OSBURN, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, pp. 686, 687, pl. 72, fig. 6.

The colonies are large, erect, jointed, and form rather large spiny-appearing masses. The zooecia are connate and arranged alternately, but with some irregularity. The number of zooecia making up one of the long internodes is highly variable. The distal portion of each zooecium is free, tubular, elongate, slender. The ovicells are obscure, not grossly swollen. The oöciostome is short and rounded and is somewhat smaller than the tubular zooecium next to it.

OCCURRENCE: Station 159, off Tiburón Island, 10 fathoms. Station 160, off Tiburón Island, 20-22 fathoms. Station 164, off San Esteban Island, intertidal to 3.25 fathoms. Station 168, off Angel de la Guarda Island, 16-17 fathoms. Station 173, Puerto Refugio, Angel de la Guarda Island, 17-19 fathoms.

DISTRIBUTION: The distributional range of this species appears to extend from warm temperate to tropical, with the majority of records in warm temperate waters off southern California. All the records from the Gulf of California are from the northern portion.

DIVISION III, CANCELLATA GREGORY, 1896

No representatives of this division were found in the Puritan collection.

DIVISION IV, CERIOPORINA HAGENOW, 1851

No representatives of this division were found in the Puritan collection.

DIVISION V, RECTANGULATA WATERS, 1887

FAMILY LICHENOPORIDAE SMITT, 1866

GENUS *lichenopora* DEFRANCE, 1823*Lichenopora buskiana* Canu and Bassler, 1928

Lichenopora buskiana CANU AND BASSLER, 1928, Proc. U. S. Natl. Mus., vol. 72, art. 14, p. 164, pl. 34, figs. 7, 8.

Not *Unicavea californica* d'Orbigny, 1853, Paléontologie Française, terrains crétacés, vol. 5, p. 972.

Lichenopora californica, CONRAD, 1855, Proc. Acad. Nat. Sci. Philadelphia, vol. 7, p. 441.

Lichenopora californica, GABB AND HORN, 1862, Jour. Acad. Nat. Sci. Philadelphia, new ser., vol. 5, pt. 2, p. 176, pl. 21, fig. 68.

Lichenopora californica, ROBERTSON, 1910, Univ. California Publ. Zool., vol. 6, no. 12, pp. 261, 262, pl. 25, figs. 48, 49.

Lichenopora californica, CANU AND BASSLER, 1923, Bull. U. S. Natl. Mus., no. 125, p. 203, pl. 44, figs. 4–7.

Lichenopora buskiana, OSBURN, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, pp. 704, 705, pl. 74, figs. 1, 2.

Colonies are circular, disc-shaped, convex, variable in size, and encrust marine algae and mollusk shells. The tubular zooecia, which are basically biserial and connate, radiate outward from the central part of the colony. Calcified septa between the rows of zooecia and in the central portion of the colony divide these regions into large, irregular cavities called “alveoli” or “cancelli.” The ovicell, located in the central area of the colony, is not obviously swollen. It possesses a large, thin-walled, tubular oeciostome with a flaring aperture.

OCCURRENCE: Station 127, off Monserrate Island, 5 fathoms. Station 129, off Monserrate Island, 3 fathoms. Station 143, Coronados Island, intertidal. Station 146, Ildefonso Island, intertidal. Station 149, San Marcos Island, intertidal. Station 150, off San Marcos Island, 5–7 fathoms. Station 154, San Carlos Bay, Sonora, Mexico, intertidal. Station 158, off Tiburón Island, 1–3 fathoms.

DISTRIBUTION: *Lichenopora buskiana* is common in the shallow waters off southern California. The Puritan collection extends the known geographical range of this species into tropical waters of the southern portion of the Gulf of California. It had been previously reported in the Gulf of California only at San Felipe Bay, Baja California (Osburn, 1950–1953, no. 3), Hancock station 1071–40. An additional specimen from Raza Island, Gulf of California, bottom sample 275, has been found in the Hancock collection.

Lichenopora novae-zelandiae (Busk), 1875

Discoporella novae-zelandiae BUSK, 1875, Catalogue of marine Polyzoa in the

British Museum, pt. 3, Cyclostomata, p. 32, pl. 30, fig. 2.

Lichenopora radiata, ROBERTSON, 1910, Univ. California Publ. Zool., vol. 6, no. 12, pp. 262, 263, pl. 24, figs. 46, 47.

? *Lichenopora radiata*, CANU AND BASSLER, 1923, Bull. U. S. Nat. Mus., 125, pp. 204, 205, pl. 44, fig. 10.

? *Lichenopora radiata*, C. H. AND E. O'DONOGHUE, 1923, Contrib. Canadian Biol. new ser., vol. 1, p. 157.

? *Lichenopora radiata*, C. H. AND E. O'DONOGHUE, 1926, Contrib. Canadian Biol. Fish., new ser., vol. 3, p. 74.

Lichenopora novae-zelandiae, OSBURN, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, pp. 705-707, pl. 74, fig. 4.

The colonies are disc-shaped and encrust the shells of mollusks and marine algae. The zooecia are tubular and arranged in uniserial rows radiating from the central portion of the colony. The so-called "alveoli" or "cancelli" are highly irregular in both size and shape. Ovicells are centrally located, some specimens showing minute pores. Each ooecio-stome is short and tubular, and has a flaring apertural lip.

OCCURRENCE: Station 084, Los Frailes Bay, Baja California, intertidal. Station 087, Pulmo Reef, Baja California, 2-4 fathoms. Station 088, Los Frailes Bay, Baja California, 7-9 fathoms. Station 090, off Cerralvo Island, 2-3.5 fathoms. Station 094, off Espíritu Santo Island, 2-2.5 fathoms. Station 109, San Francisco Island, intertidal. Station 111, off San Francisco Island, 0.5-4 fathoms. Station 125, Monserrate Island, intertidal. Station 131, off Carmen Island, 41-45 fathoms. Station 140, Marquer Bay, Carmen Island, intertidal. Station 143, Coronados Island, intertidal. Station 144, off Coronados Island, 13-16.5 fathoms. Station 150, off San Marcos Island, 5-7 fathoms. Station 160, off Tiburón Island, 20-22 fathoms.

DISTRIBUTION: *Lichenopora novae-zelandiae* is found in warm temperate and tropical waters of the eastern Pacific and the western Pacific. The record of O'Donoghue and O'Donoghue (1923, 1926) appears to be in doubt. This species, so abundantly represented in the Puritan collection, had not been recorded from the Gulf of California prior to the present report. However, in the Hancock collections specimens have been found from Raza Island, Gulf of California, bottom sample 275.

Lichenopora intricata (Busk), 1855

Defrancia intricata BUSK, 1855, in Carpenter, Catalogue of . . . Mazatlán Mollusca . . . in the British Museum, p. 6.

Defrancia intricata, BUSK, 1856, Quart. Jour. Micros. Sci., vol. 4, p. 179.

Lichenopora intricata, OSBURN, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, pp. 707, 708, pl. 76, figs. 5-9.

The colonies are extensive. Commonly a group of colonies fuses together so as to form a massive, irregular, encrusting cover adherent to marine algae, mollusk shells, or rocks. The zooecia are tubular, primarily uniserial, and arranged in rows radiating from the central area of each colony unit. The zooecial rows frequently become biserial. Calcified partitions of the central areas of each colony unit, and the zones between rows of zooecial tubules, form the "alveoli" or "cancelli" that are small and irregular in shape. The ovicells are centrally situated and inconspicuous. Each ooeciostome is tubular and short, and has a tendency to flare terminally.

OCCURRENCE: Station 081, harbor, Mazatlán, Sinaloa, Mexico, 3 fathoms. Station 089, Los Frailes Bay, Baja California, 20–40 fathoms.

DISTRIBUTION: Originally described from the region of Mazatlán, Sinaloa, Mexico (Busk, 1855), this species has since been reported by Osburn (1950–1953, no. 3) from Mazatlán, Mexico, and from Magdalena Bay on the Pacific coast of Baja California. The material in the Puritan collection extends its known bathymetric range to 40 fathoms.

GENUS *DISPORELLA* GRAY, 1848

Disporella californica (d'Orbigny), 1853

Unicavea californica D'ORBIGNY, 1853, Paléontologie Française, terrains crétacés, vol. 5, p. 972.

Disporella californica, OSBURN, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, pp. 711–713, pl. 74, figs. 7–9.

The colonies, like those of *Lichenopora*, are disc-shaped, round, and variable in size and shape. They encrust marine algae, mollusk shells, and other bryozoans. The tubular zooecia occur in uniserial, spoke-like, radial rows from the center of the colony. The "alveoli" or "cancelli" are large, rounded, and regular in size and shape. The radial, inconspicuous ovicells are located between the zooecial rows. A short tubular ooeciostome may be found between two rows of zooecia, near the central area.

OCCURRENCE: Station 087, Pulmo Reef, Baja California, 2–4 fathoms. Station 120, off San Diego Island, 25–40 fathoms. Station 129, off Monserrate Island, 3 fathoms. Station 131, off Carmen Island, 41–45 fathoms. Station 144, off Coronados Island, 13–16.5 fathoms. Station 146, Ildefonso Island, intertidal. Station 149, San Marcos Island, intertidal. Station 154, San Carlos Bay, Sonora, Mexico, intertidal. Station 158, off Tiburón Island, 1–3 fathoms. Station 159, off Tiburón Island, 10 fathoms. Station 160, off Tiburón Island, 20–22 fathoms. Station 161, off Tiburón Island, 30–32 fathoms.

DISTRIBUTION: *Disporella californica* (d'Orbigny) seems to be primarily a tropical species, extending into the warm temperate waters only as far north as Cortez Bank, just south of San Diego, California, and the channel islands off southern California. It has been reported in the Gulf of California by Osburn (1950-1953, no. 3) from bottom sample 275, Raza Island, Hancock station 1044-40; Tiburón Island and Hancock station 675-37, Carmen Island.

With regard to the distribution of *Disporella californica* (d'Orbigny), I wish to correct an error made by Osburn. Referring to *Diaperoecia californica* (d'Orbigny), 1852, he wrote (1950-1953, no. 3, pp. 643-644); "It is common in the Gulf of California and along the west coast of Mexico." This is not the case. Neither the Puritan collection nor the Hancock collections from the Gulf of California contain *Diaperoecia californica* (d'Orbigny), 1852. It is *Disporella californica* (d'Orbigny), 1853, that is "common" in the Gulf of California. The similarity in names is obvious, and it is possible that the confusion arose as a result of Osburn's using the abbreviation "*D. californica* (d'Orbigny)" in his preliminary notes.

SUBORDER CTENOSTOMATA BUSK, 1852

DIVISION I, CARNOSA GRAY, 1841

FAMILY CLAVOPORIDAE SOULE, 1953

GENUS *CLAVOPORA* BUSK, 1874

Clavopora occidentalis (Fewkes), 1889

Ascorhiza occidentalis FEWKES, 1889, Ann. Mag. Nat. Hist., ser. 6, vol. 3, pp. 2-6, pl. 1, figs. 1-6.

Ascorhiza occidentalis, ROBERTSON, 1902, Proc. California Acad. Sci., ser. 3, Zool., vol. 3, no. 3, p. 106, pl. 14, figs. 1-7.

Aschoriza occidentalis, C. H. AND E. O'DONOGHUE, 1923, Contrib. Canadian Biol., new ser., vol. 1, p. 192.

Clavopora occidentalis, C. H. AND E. O'DONOGHUE, 1926, Contrib. Canadian Biol. Fish., new ser., vol. 3, pp. 57, 58, pl. 1, figs. 7, 8.

Clavopora occidentalis, SOULE, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, pp. 735, 736, pl. 78, fig. 3.

The light tan-colored colonies are stalked, erect, and attached to the substrate by a small basal disc. No secondary zooecia are present in the material from the Gulf of California. Each colony is differentiated into a cylindrical, annulated peduncle composed of modified muscular zooecia (kenozooecia) and an expanded bulbous capitulum composed of many functional zooecia (autozooecia). The autozooecia are indistinct in outline, and each has its aperture located at the crest of a low papilla.

OCCURRENCE: Station 121, off San Diego Island, 40-50 fathoms.

DISTRIBUTION: *Clavopora occidentalis* has been reported from cool temperate waters to tropical waters in the eastern Pacific. Socorro Island, Mexico, marks the limits of its known southern range. This record is the first of this species in the Gulf of California.

DIVISION II, STOLONIFERA EHLERS, 1876

GROUP A, VESICULARINA WATERS, 1910

GENUS *NOLELLA* GOSSE, 1855

Nolella stipata Gosse, 1855

Nolella stipata GOSSE, 1855, Ann. Mag. Nat. Hist., ser. 2, vol. 16, pp. 35, 36, pl. 4, fig. 29.

Farrella gigantea BUSK, 1856, Quart. Jour. Micros. Sci., vol. 4, pp. 93–95, pl. 5, figs. 1, 2.

Farrella dilatata HINCKS, 1860, Quart. Jour. Micros. Sci., vol. 8, pp. 279, 280, pl. 30, fig. 7.

Cylindroecium giganteum, HINCKS, 1884, Ann. Mag. Nat. Hist., ser. 5, vol. 13, p. 208.

Cylindroecium giganteum, C. H. AND E. O'DONOGHUE, 1926, Contrib. Canadian Biol. Fish., new ser., vol. 3, pp. 60, 61.

Nolella stipata, SOULE, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, pp. 737, 738, pl. 78, fig. 5.

The colonies are stolonate, inconspicuous, and adherent to the shells of mollusks and other bryozoans. The large, elongated, cylindrical zooecia are erect, each arising from a weakly expanded basal area. The zooecia are frequently crowded together in dense aggregations.

OCCURRENCE: Station 089, Los Frailes Bay, Baja California, 20–40 fathoms. Station 097, off Espíritu Santo Island, 24–26 fathoms. Station 103, off Isla Partida, 12–13 fathoms. Station 114, Amortajada Bay, San José Island, 22–25 fathoms.

DISTRIBUTION: *Nolella stipata* has a geographical range that takes it from cool temperate waters to tropical waters. It previously had been reported in the Gulf of California from San Francisco Island, Hancock station 650–37 (Soule, 1953).

FAMILY VESICULARIIDAE JOHNSTON, 1838

GENUS *AMATHIA* LAMOUROUX, 1812

Amathia convoluta Lamouroux, 1816

Amathia convoluta LAMOUROUX, 1816, Histoire des polypiers coralligènes flexibles, vulgairement nommés zoophytes, p. 169.

Amathia convoluta, SOULE, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, pp. 740, 741, pl. 78, fig. 7.

The colonies are distinctive, very large, erect, and conspicuous. Each stolon is tubular, thick, and well chitinized. The zooecia also are large, completely connate, biserial, and are arranged in a loose spiral that encircles and almost fills an internode. In size, this species is the largest of the genus *Amathia* in the eastern Pacific.

OCCURRENCE: Station 115, off San José Island, 13.5–17.5 fathoms.

DISTRIBUTION: In the eastern Pacific this species is restricted to tropical waters. Elsewhere, it has been reported from warm temperate regions as well as tropical. This record is the first of its presence in the Gulf of California.

Amathia vidovici (Heller), 1867

Valkeria vidovici HELLER, 1867, Verhandl. Zool.-Bot. Gesell. Wien, vol. 17, pp. 128, 129, pl. 5, figs. 3, 4.

Amathia vidovici, SOULE, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, p. 741, pl. 79, fig. 2.

The colonies are erect, branching, and bushy, and their stolons are thin and lengthy. The zooecia are small and arranged biserially in the form of a short spiral about the upper (distal) portion of each internode. The zooecia are attached (connate) only at their basal portion.

OCCURRENCE: Station 098, San Gabriel Bay, Espíritu Santo Island, 1–1.5 fathoms. Station 120, off San Diego Island, 25–40 fathoms. Station 132, off Carmen Island, 14–30 fathoms.

DISTRIBUTION: Material in the Hancock collections shows a geographical distribution from the waters off southern California to Ecuador, including specimens from the Galapagos Islands, a range from warm temperate to tropical. This record is the first of this species in the Gulf of California.

Amathia distans Busk, 1886

Amathia distans BUSK, 1886, Report on the scientific results of the voyage of H. M. S. Challenger, vol. 17, pt. 3, p. 33, pl. 7, fig. 1.

Amathia distans, C. H. AND E. O'DONOGHUE, 1925, Trans. Puget Sound Biol. Sta., vol. 5, p. 16.

Amathia distans, SOULE, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, pp. 741, 742, pl. 79, fig. 1.

The colonies are small, delicate in appearance, branching, reptant, and inconspicuous. The stolons are long and slender. The zooecia are connate and arranged in a biserial spiral that occupies the distal portion of each internode.

OCCURRENCE: Station 144, off Coronados Island, 13–16.5 fathoms.

Station 160, off Tiburón Island, 20–22 fathoms. Station 161, off Tiburón Island, 30–32 fathoms. Station 162, off Tiburón Island, 40 fathoms. Station 173, Puerto Refugio, Angel de la Guarda Island, 17–19 fathoms.

DISTRIBUTION: The known geographical range of *Amathia distans* is from cool temperate to tropical waters. This report is the first of this species from the Gulf of California.

GENUS *ZOOBOTRYON* EHRENBERG, 1831

Zoobotryon verticillatum (delle Chiaje), 1828

Hydra verticillata DELLE CHIAJE, 1828, Memorie sulla storia e notamia degli animale senza vertebre del regno di Napoli, vol. 3, p. 203.

Zoobotryon pellucidus EHRENBERG, 1831, Symbolae physicae . . . pars zoologica, no page.

Zoobotryon verticillatum, SOULE, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, pp. 742, 743, pl. 79, fig. 3.

The zooecial arrangement is irregular, either occurring in a linear series or aggregated into dense clumps.

OCCURRENCE: Station 076, Olas Altas Bay, Mazatlán, Sinaloa, Mexico, intertidal. Station 084, Los Frailes Bay, Baja California, intertidal. Station 109, San Francisco Island, intertidal.

DISTRIBUTION: This species appears to be circumtropical in its geographical distribution. In the eastern Pacific it has been taken in Mission Bay, San Diego, California, and at La Jolla, California. In 1959, as a result of the increased temperature of the waters off southern California over the past few years, I found this species north of San Diego County at Newport Harbor, Orange County, California.

GENUS *BOWERBANKIA* FARRE, 1837

Bowerbankia gracilis Leidy, 1855

Bowerbankia gracilis LEIDY, 1855, Jour. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 3, pp. 142, 143, pl. 11, fig. 38.

Bowerbankia gracilis, C. H. AND E. O'DONOGHUE, 1923, Contrib. Canadian Biol., new ser., vol. 1, p. 192.

Bowerbankia gracilis, C. H. AND E. O'DONOGHUE, 1925, Trans. Puget Sound Biol. Sta., vol. 5, p. 93.

Bowerbankia gracilis, C. H. AND E. O'DONOGHUE, 1926, Contrib. Canadian Biol. Fish., new ser., vol. 3, p. 58.

Bowerbankia gracilis, SOULE, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, pp. 743, 744, pl. 79, fig. 5.

The colonies are stolonate, reptant, and form irregular clumps of varying size, attached to marine algae, mollusk shells, and other bryozoans. The stolons are slender, branching, and divided into internodes of variable

length. The zooecia are elongated, tubular, and their polypides are provided with a muscular gizzard. A few of the zooecia exhibit a small, spur-like, proximal, caudate appendage.

OCCURRENCE: Station 076, Olas Altas Bay, Mazatlán, Sinaloa, Mexico, intertidal. Station 078, Olas Altas Bay, Mazatlán, Sinaloa, Mexico, intertidal. Station 084, Los Frailes Bay, Baja California, intertidal. Station 087, Pulmo Reef, Baja California, 2–4 fathoms. Station 090, off Cerralvo Island, 2–3.5 fathoms. Station 124, off Baja California, between Point San Marcial and Aqua Verde Bay, Baja California, 1–3 fathoms. Station 136, lagoon, Puerto Escondido, Baja California, intertidal. Station 143, Coronados Island, intertidal. Station 154, San Carlos Bay, Sonora, Mexico, intertidal.

DISTRIBUTION: In *Bowerbankia gracilis* we have another example of a “cosmopolitan species,” with a wide range of tolerance from tropical waters to the arctic. In the eastern Pacific it has been reported from Puget Sound, Washington, to the Gulf of California (Espíritu Santo Island) (Soule, 1953). In the Hancock collections an additional specimen has been found that extends the known geographical range in the eastern Pacific to the Seca Islands, Panama, Hancock station 866–38.

GROUP B, WALKERINA, NEW NAME

The term Walkerina is an emendation of the original term Valkerina proposed by Silén in 1942.

FAMILY WALKERIIDAE BASSLER, 1953

GENUS *WALKERIA* FLEMING, 1823

Walkeria tuberosa Heller, 1867

Walkeria tuberosa HELLER, 1867, Verhandl. Zool.-Bot. Gesell. Wien, vol. 17, p. 129, pl. 6, fig. 3.

Walkeria tuberosa, SOULE, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, p. 745, pl. 79, fig. 7.

The colonies are stolonate, small, inconspicuous, and reptant. Their stolons are elongate, slender, and delicate, with internodes of varying length. The junction of each internode is expanded, in some specimens giving rise to a lateral branch. Here, at the distal end of an internode, the zooecia arise, radiating outward to each side of the stolon. The proximal portion of each zooecium is stalk-like, short, slender, and marked by minute annulations. The remainder of the zooecium is tubular, expanded, and short, the length of the zooecia ranging from 400 to 550 microns.

OCCURRENCE: Station 115, off San José Island, 13.5–17.5 fathoms.

Station 119, off San Diego Island, 10–15 fathoms. Station 144, off Coronados Island, 13–16.5 fathoms.

DISTRIBUTION: The geographic distribution of this species is still poorly known. Originally described from the Adriatic Sea (Heller, 1867), it has been reported by Harmer (1915) in the tropical western Pacific. In the eastern Pacific its known range is limited; material in the Hancock collection is from La Jolla, California, and Coronados Island off the west coast of Baja California. The Hancock collection revealed a specimen from Puerto Refugio, Angel de la Guarda Island, in the Gulf of California, Hancock station 1048–40, 11–22 fathoms. *Walkeria tuberosa* has not been recorded from the Gulf of California prior to the present report.

GENUS *AEVERRILLIA* MARCUS, 1941

Aeverrillia setigera (Hincks), 1887

Buskia setigera HINCKS, 1887, Jour. Linnean Soc. London, Zool., vol. 21, p. 127, pl. 12, figs. 9–13.

Aeverrillia setigera, SOULE, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, pp. 745, 746, pl. 79, fig. 8.

The colonies are stolonate, minute, and reptant. The stolons, which are adherent to the substrate (marine algae in the Gulf of California material), are divided by septa into internodes of varying length. Lateral branching occurs, usually in pairs, with a branch on each side of the main stolon. The zooecia are paired, each arising from a short, stalk-like kenozoecium. The proximal part of each zooecium is rounded and exhibits two short, spine-like protuberances. The zooecia taper distally, and possess an aperture surrounded by four spinous processes. Frequently, an elongate setigerous collar extends from the aperture.

OCCURRENCE: Station 076, Olas Altas Bay, Mazatlán, Sinaloa, Mexico, intertidal.

DISTRIBUTION: Widely distributed, *Aeverrillia setigera* has been reported from cool temperate, warm temperate, and tropical waters. It has been recorded in the tropical waters of the eastern Pacific by Soule (1953). This report is the first of its presence in the Gulf of California.

FAMILY BUSKIIDAE HINCKS, 1880

GENUS *BUSKIA* ALDER, 1857

Buskia seriata Soule, 1953

Buskia seriata SOULE, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, pp. 747, 748, pl. 80, fig. 2.

The colonies are large, prominent, primarily erect, and branching. The stolons are stout and are divided by septa into internodes of variable length. The zooecia bud off to form irregular assemblages along the stolon in an alternate, paired, linear series, one cluster of zooecia in each internode. They are small and tubular, and have a rounded proximal portion that bears one or two small, blunt, spine-like protuberances, and taper distally toward the aperture. The aperture often exhibits a short, protruding, setigerous collar.

OCCURRENCE: Station 092, Espíritu Santo Island, intertidal.

DISTRIBUTION: The geographical range of this species is still poorly known. At the present time it has been reported from the Galapagos Islands and the Gulf of California. It has been previously reported from the Gulf of California in the San Lorenzo Channel, Hancock station 1111-40, by Soule (1953).

GROUP C, TEREBRIPORINA SOULE, 1953

FAMILY TEREBRIPORIDAE D'ORBIGNY, 1847

GENUS *TEREBRIPORA* D'ORBIGNY, 1847

Terebripora comma Soule, 1950

Terebripora comma SOULE, 1950, Jour. Washington Acad. Sci., vol. 40, no. 11, pp. 380, 381, figs. 1-3.

Terebripora comma, SOULE, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, p. 752, pl. 80, fig. 6.

The colonies are stolonate, inconspicuous, and embedded within the shells of mollusks. Their presence is revealed by small, comma-shaped openings on the surface of the mollusk shell. The mollusk shell must be dissolved with a mild acid (5% trichloroacetic acid), the colony stained (10% azo-carmines or safranine in 70% ethyl alcohol), then mounted in one of the synthetic mounting media (Permount), before any of the burrowing bryozoans can be identified properly, even as to the genus. The zooecia are alternate and are attached to the primary stolon by means of a short secondary stolon that joins the zooid about halfway between its distal and proximal ends. The autozooids are elongate, cylindrical, small, and taper to a bluntly rounded proximal tip. Reproductive zooids, also cylindrical, are identified by their ovoid embryo. The tentacles number eight.

OCCURRENCE: Station 115, off Amortajada Bay, San José Island, 13.5-17.5 fathoms.

DISTRIBUTION: Originally described from the waters off southern California (Soule, 1950a), *Terebripora comma* has been reported from the

Mediterranean coast of France by Gautier (1956) and Prenant and Bobin (1956). The range for this species is from warm temperate to tropical waters. It has not been recorded from the Gulf of California prior to the present report.

FAMILY IMMERGENTIIDAE SILÉN, 1946

GENUS *IMMERGENTIA* SILÉN, 1946

Immergentia californica Silén, 1946

Immergentia californica SILÉN, 1946, Arkiv Zool., vol. 38B, no. 1, p. 6, figs. 9, 10.
Immergentia californica, SOULE, 1950, Trans. Amer. Micros. Soc., vol. 69, no. 4, p. 364, pl. 1, fig. 2.

Immergentia californica, SOULE, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, p. 753, pl. 80, fig. 7.

The colonies are restricted in size, minute, burrowing, and embedded within the shells of both gastropod and pelecypod mollusks. Delicate stolon-like processes are direct extensions of the distal ends of the zooids, joining the zooids in series. The zooids are small, cylindrical, elongate, and narrow to a bluntly pointed proximal tip. They are arranged in moderately straight rows, with lateral branches extending to the sides at irregular intervals. The tentacle number is 10.

OCCURRENCE: Station 076, Olas Altas Bay, Mazatlán, Sinaloa, Mexico, intertidal. Station 078, Olas Altas Bay, Mazatlán, Sinaloa, Mexico, intertidal. Station 090, off Cerralvo Island, 2–3.5 fathoms. Station 101, Isla Partida, intertidal. Station 105, off Isla Partida, 3–5 fathoms. Station 109, San Francisco Island, intertidal.

DISTRIBUTION: Described originally from Pacific Grove, California, by Silén (1946), this species has since been found in the intertidal zone of southern California (Soule, 1950a, 1953). The present record represents a significant southern extension of range of the species and establishes a new bathymetric record.

FAMILY PENETRANTIIDAE SILÉN, 1946

GENUS *PENETRANTIA* SILÉN, 1946

Penetrantia densa Silén, 1946

Penetrantia densa SILÉN, 1946, Arkiv Zool., vol. 38B, no. 1, pp. 2–4, figs. 1–4.
Penetrantia densa, SOULE, 1950, Trans. Amer. Micros. Soc., vol. 69, no. 4, p. 360, pl. 1, fig. 1.

Penetrantia densa, SOULE, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, pp. 753, 754, pl. 80, fig. 8.

Like the others of the group Terebriporina, the colonies are burrowing, embedded within the shells of mollusks. The zooids are connected in series by thin stolons. The primary stolons are frequently serrated on their upper surface, leaving a trace on the shell surface. The primary stolons are joined to the zooids by short, lateral, secondary stolons, attached near the distal end. The openings of the operculated zooids upon the shell surface are characteristically densely crowded together. The autozooids are comparatively large, cylindrical, elongated, and terminate in a bluntly pointed, proximal tip. The reproductive zooids have a "pot-bellied" appearance owing to the swollen embryo chamber. The proximal tip of the reproductive zooid is elongated and slender, and extends well below the bottom of the embryo chamber. Tentacles are eight in number.

OCCURRENCE: Station 076, Olas Altas Bay, Mazatlán, Sinaloa, Mexico, intertidal. Station 085, Los Frailes Bay, Baja California, 3 fathoms. Station 090, off Cerralvo Island, 2–3.5 fathoms. Station 101, Isla Partida, intertidal. Station 105, off Isla Partida, 3–5, fathoms. Station 109, San Francisco Island, intertidal. Station 113, Amortajada Bay, San José Island, intertidal. Station 128, off Monserrate Island, 5–6 fathoms. Station 167, off Angel de la Guarda Island, 15–17 fathoms. Station 168, off Angel de la Guarda Island, 16–17 fathoms.

DISTRIBUTION: *Penetrantia densa* was described from material collected at the Cape of Good Hope, Africa, and the west coast of South Africa, both from the intertidal zone (Silén, 1946). Silén provisionally included material from Panama. Soule (1950a, 1953) reported this species from the intertidal zone of La Jolla and San Pedro, California. The apparent geographical range is from warm temperate to tropical waters. The Puritan collection establishes new bathymetric records for this species. It has not previously been reported from the Gulf of California.

PHYLUM ENTOPROCTA NITSCHKE, 1869

FAMILY PEDICELLINIDAE JOHNSTON, 1847

GENUS *BARENTSIA* HINCKS, 1880

Barentsia discreta (Busk), 1886

Ascopodaria discreta BUSK, 1886, Report on the scientific results of the voyage of H. M. S. Challenger, vol. 17, pt. 3, p. 44.

Barentsia discreta, OSBURN, 1953, in Allan Hancock Foundation publications of the University of Southern California, vol. 14, no. 3, pp. 776, 767, pl. 82, fig. 8.

The delicate-appearing colonies are composed of slender, adnate, jointed stolons that give rise to pedicels that are topped by calices. The pedicels are slender, elongated, and chitinous. They arise from the

TABLE 1
SUMMARY OF THE KNOWN DISTRIBUTION AND AFFINITIES
OF THE RECENT BRYOZOAN FAUNA OF THE GULF OF CALIFORNIA

| | Indo- Pacific | West Indies | Eastern Pacific ^a | Panamic |
|--|------------------|----------------|---------------------------------|---------|
| PHYLUM ECTOPROCTA | | | | |
| CHEILOSTOMATA ANASCA | | | | |
| <i>Aetea anguina</i> ^b | x | x | x | x |
| <i>Aetea recta</i> | x | x | x | x |
| <i>Aetea ligulata</i> | — | x | x | x |
| <i>Membranipora tuberculata</i> | x | x | x | x |
| <i>Membranipora tenuis</i> | — | x | x | x |
| <i>Membranipora savarti</i> | x | x | x | x |
| <i>Conopeum commensale</i> | — | x | — | x |
| <i>Cupuladria canariensis</i> | — | x | — | — |
| <i>Electra crustulenta</i> ^{b, c} | — | — | x | — |
| <i>Electra tenella</i> ^{b, c, e} | — | x | — | — |
| <i>Aplousina filum</i> | — | x | — | x |
| <i>Antropora claustracrassa</i> | — | — | — | x |
| <i>Antropora tinctoria</i> ^b | x | — | x | x |
| <i>Cauloramphus spiniferum</i> ^b | — | — | x | x |
| <i>Cauloramphus brunea</i> ^b | — | — | — | x |
| <i>Alderina smitti</i> | — | x | x | x |
| <i>Copidozoum tenuirostre</i> ^b | x | x | x | x |
| <i>Copidozoum protectum</i> | — | — | x | x |
| <i>Retevirgula tubulata</i> | — | x | — | x |
| <i>Retevirgula lata</i> | — | — | — | x |
| <i>Retevirgula areolata</i> ^{b, c} | — | — | x | — |
| <i>Retevirgula osburni</i> ^d | — | — | — | — |
| <i>Chaperiella patula</i> ^b | — | — | x | x |
| <i>Chaperiella condylata</i> | — | — | x | x |
| <i>Chaperiella quadrispina</i> ^d | — | — | — | — |
| <i>Anexechona ancorata</i> | — | — | — | x |
| <i>Tremogasterina granulata magnipora</i> ^d | — | — | — | — |
| <i>Floridina antiqua</i> | — | x | — | x |
| <i>Velumella americana</i> ^b | — | x | — | x |
| <i>Micropora coriacea inarmata</i> ^d | — | — | — | — |
| <i>Labioporella sinuosa</i> | — | x | — | x |
| <i>Thalamoporella gothica</i> | x | — | — | x |
| <i>Thalamoporella californica</i> | x | — | x | x |
| <i>Discoporella umbellata</i> | x | x | x | x |
| <i>Scrupocellaria bertholleti</i> | — | x | x | x |
| <i>Scrupocellaria bertholleti tenuirostris</i> | — | — | x | x |
| <i>Scrupocellaria mexicana</i> | — | — | x | x |
| <i>Scrupocellaria scruposa</i> | — | — | — | x |
| <i>Scrupocellaria varians</i> | — | — | x | x |
| <i>Synnotum aegyptiacum</i> | x | x | x | x |

TABLE 1—(Continued)

| | Indo-Pacific | West Indies | Eastern Pacific | Panamic |
|---|--------------|-------------|-----------------|---------|
| <i>Bugula neritina</i> | x | x | x | x |
| <i>Bugula minima</i> ^b | x | x | — | x |
| <i>Bugula longirostrata</i> | — | — | x | x |
| <i>Bugula californica</i> | — | x | x | x |
| <i>Bugula avicularia</i> ^b | — | x | x | x |
| <i>Sessibugula translucens</i> | — | — | — | x |
| <i>Beania mirabilis</i> ^b | x | x | x | x |
| <i>Beania cupulariensis</i> ^{b, c, e} | — | x | — | — |
| <i>Beania magellanica</i> ^b | x | — | — | x |
| <i>Membraniporella aragoi pacifica</i> | — | — | — | x |
| <i>Membraniporella baueri</i> ^d | — | — | — | — |
| <i>Reginella mucronata</i> | — | — | x | x |
| <i>Colletosia radiata</i> ^b | x | x | x | x |
| <i>Colletosia radiata flabellifera</i> ^{b, c, e} | x | — | — | — |
| <i>Colletosia bellula</i> | — | — | — | x |
| <i>Figularia hilli</i> ^{b, c} | — | — | x | — |
| CHEILOSTOMATA ASCOPHORA | | | | |
| <i>Hippothoa hyalina</i> ^b | x | x | x | x |
| <i>Hippothoa divaricata</i> | — | x | x | x |
| <i>Hippothoa distans</i> | x | x | x | x |
| <i>Hippothoa expansa</i> ^{b, c} | — | — | x | — |
| <i>Trypostega venusta</i> | x | x | x | x |
| <i>Cyclicopora longipora</i> | — | — | — | x |
| <i>Hippopetraliella magna</i> ^b | x | — | — | x |
| <i>Hippopodina californica</i> | — | — | x | x |
| <i>Cycloperiella rosacea</i> | — | x | — | x |
| <i>Hippopleurifera mucronata</i> | — | x | — | x |
| <i>Schizoporella unicornis</i> ^b | x | x | x | x |
| <i>Schizoporella trichotoma</i> | — | — | — | x |
| <i>Schizoporella inarmata</i> | — | — | x | x |
| <i>Schizoporella cornuta</i> | — | — | x | x |
| <i>Schizoporella dissimilis</i> | — | — | — | x |
| <i>Dakaria ordinata</i> ^b | — | — | x | x |
| <i>Dakaria sertata</i> | — | x | x | x |
| <i>Schizomavella auriculata</i> | x | — | x | x |
| <i>Arthropoma circinata</i> | x | — | x | x |
| <i>Escharina vulgaris</i> | — | — | — | x |
| <i>Stylopoma informata</i> ^b | x | x | — | x |
| <i>Gemelliporidra aculeata</i> ^{b, c, e} | — | x | — | — |
| <i>Hippodiplosia insculpta</i> | — | — | x | x |
| <i>Cleidochasma porcellana</i> ^b | — | x | x | x |
| <i>Cleidochasma contracta</i> ^b | — | x | — | x |
| <i>Hippoporella gorgonensis</i> | — | — | x | x |
| <i>Aimulosia uvulifera</i> ^b | — | x | — | x |

TABLE 1—(Continued)

| | Indo-Pacific | West Indies | Eastern Pacific | Panamic |
|--|--------------|-------------|-----------------|---------|
| <i>Aimulosia palliolata</i> | — | x | — | x |
| <i>Hippomonavella longirostrata</i> | — | — | x | x |
| <i>Stephanosella vitrea</i> | — | — | x | x |
| <i>Microporella ciliata</i> | x | x | x | x |
| <i>Microporella californica</i> | — | — | x | x |
| <i>Microporella marsupiata</i> ^b | — | — | — | x |
| <i>Microporella pontifica</i> | — | — | — | x |
| <i>Microporella gibbosa</i> | — | — | — | x |
| <i>Microporella coronata</i> | x | — | — | x |
| <i>Microporella cribrosa</i> ^b | — | — | x | x |
| <i>Fenestulina malusi</i> | x | x | x | x |
| <i>Porella porifera</i> ^b | — | — | x | x |
| <i>Porella rogickae</i> | — | — | — | — |
| <i>Smittina landsborovi</i> | x | x | x | x |
| <i>Smittina maccullochia</i> ^b | — | — | x | x |
| <i>Smittoidea prolifica</i> ^b | — | — | x | x |
| <i>Smittoidea reticulata</i> | x | — | — | x |
| <i>Parasmittina trispinosa</i> | x | x | x | x |
| <i>Parasmittina californica</i> | — | — | x | x |
| <i>Parasmittina crosslandi</i> | — | — | — | x |
| <i>Parasmittina fraseri</i> ^b | — | — | — | x |
| <i>Mucronella major</i> ^b | — | — | x | x |
| <i>Reptadeonella violacea</i> | x | x | — | x |
| <i>Reptadeonella hymanae</i> ^d | — | — | — | — |
| <i>Reteporellina bilabiata</i> | — | — | — | x |
| <i>Reteporellina denticulata gracilis</i> ^b | — | — | — | x |
| <i>Phidolopora labiata</i> | — | — | x | x |
| <i>Rhynchozoon rostratum</i> | — | x | x | x |
| <i>Rhynchozoon grandicella</i> ^b | — | — | x | x |
| <i>Hippopodinella adpressa</i> | x | — | — | x |
| <i>Watersipora cucullata</i> | x | x | — | x |
| <i>Watersipora nigra</i> ^b | — | — | — | x |
| <i>Hippaliosina rostrigera</i> | — | x | — | x |
| <i>Crepidacantha poissoni</i> | x | x | x | x |
| <i>Crepidacantha setigera</i> ^b | — | x | — | x |
| <i>Lagenipora punctulata</i> | — | — | x | x |
| <i>Lagenipora spinulosa</i> | — | — | x | x |
| <i>Lagenipora socialis</i> ^b | — | — | x | x |
| <i>Lagenipora hippocrepis</i> ^b | — | — | x | x |
| <i>Lagenipora lacunosa</i> | — | — | x | x |
| <i>Schismopora anatina</i> ^b | — | — | — | x |
| <i>Schismopora globosa</i> ^d | — | — | — | — |
| <i>Holoporella brunnea</i> | — | x | x | x |
| <i>Holoporella quadrispinosa</i> ^b | — | — | — | x |
| <i>Holoporella minuta</i> ^d | — | — | — | — |

TABLE 1—(Continued)

| | Indo-Pacific | West Indies | Eastern Pacific | Panamic |
|---|--------------|-------------|-----------------|---------|
| <i>Trematoecia hexagonalis</i> | — | — | — | x |
| <i>Celleporina costazi</i> ^{b, c} | x | x | x | — |
| <i>Mammillopora cupula</i> | — | x | — | x |
| CYCLOSTOMATA | | | | |
| <i>Stomatopora granulata</i> ^{b, c} | x | — | x | — |
| <i>Plagioecia sarniensis</i> ^b | x | x | x | x |
| <i>Plagioecia tortuosa</i> | — | — | x | x |
| <i>Tubulipora tuba</i> | — | — | x | x |
| <i>Tubulipora pacifica</i> ^b | — | — | x | x |
| <i>Tubulipora flexuosa</i> | x | x | — | x |
| <i>Fasciculipora pacifica</i> | — | — | x | x |
| <i>Filicrisia franciscana</i> ^{b, c} | — | — | x | — |
| <i>Crisia serrulata</i> | — | — | x | x |
| <i>Crisia operculata</i> | — | — | x | x |
| <i>Crisulipora occidentalis</i> | — | — | x | x |
| <i>Lichenopora buskiana</i> | — | x | x | x |
| <i>Lichenopora novae-zelandiae</i> ^b | x | — | x | x |
| <i>Lichenopora intricata</i> ^b | — | — | — | x |
| <i>Disporella californica</i> | — | — | x | x |
| CTENOSTOMATA | | | | |
| <i>Clavopora occidentalis</i> ^b | — | — | x | x |
| <i>Nolella stipata</i> | x | x | x | x |
| <i>Amathia convoluta</i> ^b | x | x | — | x |
| <i>Amathia vidovici</i> | — | x | x | x |
| <i>Amathia distans</i> | x | x | x | x |
| <i>Zoobotryon verticillatum</i> ^b | x | x | x | x |
| <i>Bowerbankia gracilis</i> | — | x | x | x |
| <i>Walkeria tuberosa</i> ^b | x | — | — | x |
| <i>Aeoverrillia setigera</i> ^b | x | x | — | x |
| <i>Buskia seriata</i> | — | — | — | x |
| <i>Terebripora comma</i> ^{b, c} | — | — | x | — |
| <i>Immergentia californica</i> ^{b, c} | — | — | x | — |
| <i>Penetrantia densa</i> ^b | — | — | x | x |
| PHYLUM ENTOPROCTA | | | | |
| <i>Barentsia discreta</i> ^b | x | x | x | x |

^a Exclusive of the Panamic faunal province.^b No prior record in the Gulf of California.^c No prior record in the Panamic region.^d New species in the Puritan collection.^e Occurrence for the first time in the eastern Pacific.

stolons upon annulated, muscular, cylindrical, basal enlargements. At the apex of each pedicel is a swollen bulbous calyx bearing a circle of ciliated tentacles and a U-shaped alimentary tract.

OCCURRENCE: Station 132, off Carmen Island, 14–30 fathoms. Station 144, off Coronados Island, 13–16.5 fathoms.

DISTRIBUTION: This species was originally described from the south Atlantic and was reported for the first time from eastern Pacific waters by Osburn (1950–1953, no. 3). This report is the first of its occurrence in the Gulf of California.

SUMMARY

Tabulation (see table 1) of the bryozoans, Ectoprocta, and Entoprocta in the present collections reveals the numerical superiority of the suborder Cheilostomata, with 131 species. The Anasca Cheilostomata have 56 (Soule, 1959); the Ascophora Cheilostomata, 75 (Soule, 1961). The present report describes 15 species of the suborder Cyclostomata, 13 species of the suborder Ctenostomata, and one representative of the phylum Entoprocta. Thus the total number of species of bryozoans in the Puritan collection is 160.

Further analysis of this Puritan collection reveals that there are 59 species reported from the Gulf of California for the first time. In addition, the Puritan collection adds 13 species to the Panamic faunal list, contains four species previously unknown to the waters of the eastern Pacific, and, lastly, adds nine new species, all in the suborder Cheilostomata, to the phylum. With the exception of the new species, all the bryozoans in the Puritan collection have been reported from faunal provinces other than the Panamic province. Additional collections and study will be needed to demonstrate instances of endemic species in the Gulf of California. At the completion of Osburn's study of the eastern Pacific bryozoans (1950–1953), 133 species were recorded from the Gulf of California. With the additional material provided by the Puritan-American Museum expedition, the bryozoan fauna of this region now numbers 200 species.

In a recent paper (Soule, 1960), a brief account was given of the distribution and faunal affinities of the bryozoan fauna of both the Gulf of California and the Pacific coast of Baja California. It was based in part on Osburn's 1950–1953 monograph and in part on the study of the Puritan collection that was in progress at that time. This paper indicated, with regard to the bryozoans, that in its faunal affinities, the Gulf of California is decidedly Panamic in character. With the study of the Puritan collection now complete, the faunal affinity picture is not appreciably changed. As can be seen in table 1, the fauna is strongly Pana-

mic, followed in decreasing order by representatives of the eastern Pacific (exclusive of the Panamic faunal province), the West Indies, and the Indo-Pacific.

The study of the distributional pattern of the bryozoans of the Puritan collection within the Gulf of California reveals three areas, only slightly revised by additional material from the earlier study (Soule, 1960). As shown by the map (fig. 1), the southern one-third of the Gulf of California supports a bryozoan fauna that is distinctly tropical. Here, 52 per cent of the bryozoans have a well-established tropical distribution, 34 per cent of the species are also found in warm temperate waters, and 14 per cent of the known fauna of this area have representatives in cool temperate waters. This tropical type of zone covers a linear distance of approximately 230 miles, from the region of Cape San Lucas northward to just north of Carmen Island, about latitude 26° N. It is continuous with a region on the Pacific coast of Baja California running from Cape San Lucas northward to Magdalena Bay, a linear distance of about 170 miles, and possesses a fauna with the following ratio: 50 per cent tropical, 34 per cent warm temperate, and 16 per cent cool temperate.

In the Gulf of California, immediately north of the tropical area, is a central zone of transition. In this region the tropical species are reduced to 46 per cent, the warm temperate increased to 39 per cent, and the cool temperate almost unchanged at 15 per cent. This central transitional type of zone extends northward for about 160 miles, from about latitude 26° N. to about latitude 28° N., just north of Guaymas, Sonora, Mexico. On the Pacific coast of Baja California, there is a similar zone of transitional type, ranging from Magdalena Bay northward to just south of Point Eugenia, a linear distance of about 270 miles. This area shows the following ratio: 43 per cent tropical, 42 per cent warm temperate, and 16 per cent cool temperate.

In the Gulf of California, the remaining 300 linear miles north of the transitional zone possesses a fauna that can be referred to as subtropical. The tropical representatives comprise 45 per cent of the fauna; the warm temperate, 32 per cent; and the cool temperate, 23 per cent.

A third zone is present on the Pacific coast of Baja California, which differs substantially from the northern area of the Gulf of California. Here, except for major embayments such as Scammon's Lagoon, is found a warm temperate fauna with the following ratio: 27 per cent tropical, 42 per cent warm temperate, and 31 per cent cool temperate. This zone extends from Point Eugenia northward above the political boundary between Baja California Norte and California, to meet the cool temperate waters at Point Conception, California.

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